



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/692,968

10/24/2003

Tsann Lin

SJO920000163US2

1824

36023

7590

04/21/2006

HITACHI GLOBAL STORAGE TECHNOLOGIES, INC.
5600 COTTLE ROAD, NHGB/0142
IP DEPARTMENT
SAN JOSE, CA 95193

EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT

PAPER NUMBER

1753

DATE MAILED: 04/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/692,968	Applicant(s) LIN ET AL.	
	Examiner Rodney G. McDonald	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 February 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 24-26 and 36-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 24-26 and 36-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 24-26 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,635,835 to Mouchot et al. (Mouchot) in view of US 6,381,105 B1 to Huai et al. (Huai), US 6,341,053 B1 to Nakada et al. (Nakada) and US 6,590,803 B2 to Saito et al. (Saito).

3. For claim 24, Applicant requires a method of fabricating a dual spin valve sensor that comprises: sputter depositing the multilayer dual SV sensor including a first spin valve stack, a second spin valve stack, and a longitudinal bias stack between the first and second SV stacks; annealing the sensor at a temperature in a magnetic field perpendicular to an air bearing surface; and annealing at a second temperature below the first temperature in a second magnetic field oriented parallel to the air bearing surface where the second field is lower than the first field.

4. Mouchot discloses forming a dual spin valve sensor (Figure 6). Mouchot does not disclose the method of making the spin valve sensor.

5. Huai discloses forming a dual spin valve sensor by sputtering (col. 9, l. 8-40).

6. Saito discloses that MTJ sensors can have a spin valve type structure and thus, are formed similarly using similar techniques (col. 8, l. 53-67).

7. Nakada discloses that when an MTJ sensor is formed, it is beneficial to use a two step anneal where the first anneal is at 270C and about 3000 Oe and the second anneal is at 150C at about 50 Oe (col. 6, l. 33-40).

8. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Mouchot to utilize a two step anneal as taught by Nakada because of the desire to magnetize the structure.

9. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize sputtering as the deposition method in Mouchot as taught by Huai because of the knowledge that sputtering is a conventional method for deposition in spin valve sensors.

10. For claim 25, Applicant requires the first temperature to be about 280C and the second is about 240C. As noted above, Nakada discloses the limitations.

11. For claim 26, Applicant requires the first magnetic field to be about 10000 Oe and the second magnetic field to be about 200 Oe. As noted above, Nakada discloses the limitations.

12. For claim 36, Applicant requires depositing a first decoupling layer; depositing a first ferromagnetic layer; depositing a layer of antiferromagnetic material; depositing a second ferromagnetic layer; and depositing a second decoupling layer. Mouchot discloses a first decoupling layer 16, ferromagnetic layer 14, antiferromagnetic layer 19, second ferromagnetic layer (upper 14 layer in Figure 6), and second decoupling layer 17.

Art Unit: 1753

13. For claim 37, Applicant requires the decoupling layer to comprise Cu-O and Ru. Mouchot does not disclose the material of the decoupling layer. Huai discloses that conventional materials for the decoupling layer include Cu-O and Ru (col. 9, l. 20-30).

14. For claim 38, Applicant requires the ferromagnetic layers to be Co-Fe. Mouchot discloses the layers to be Co-Fe (col. 5, l. 1-4).

15. For claim 39, Applicant requires the antiferromagnetic layer to comprise Ir-Mn. Huai discloses that IrMn, and FeMn are interchangeable, conventional, and equivalent antiferromagnetic layers in spin valve sensors (col. 8, l. 59-63).

16. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,635,835 to Mouchot et al. (Mouchot) in view of US 6,381,105 B1 to Huai et al. (Huai), US 6,341,053 B1 to Nakada et al. (Nakada) and US 6,590,803 B2 to Saito et al. (Saito) as applied to claims 24-26 and 36-39 above, and further in view of US 6,700,757 B2 to Pinarbasi.

17. For claims 40 and 41, Applicant requires the depositing to be DC magnetron sputtering.

18. Mouchot, Huai, Nakada, and Saito are described above, but none of the references discloses DC magnetron sputtering. Huai does, however, indicate that sputtering can be used.

19. Pinarbasi discloses that a conventional deposition method for dual spin valve sensors is magnetron DC sputtering.

20. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Mouchot in view of Huai, Nakada, and

Art Unit: 1753

Saito to utilize DC magnetron sputtering because of the knowledge that it is a conventional deposition method for spin valve sensors.

21. Claims 24-26 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. 6,275,363 to Gill in view of US 6,381,105 B1 to Huai et al. (Huai), US 6,341,053 B1 to Nakada et al. (Nakada) and US 6,590,803 B2 to Saito et al. (Saito).

22. For claim 24, Applicant requires a method of fabricating a dual spin valve sensor that comprises: sputter depositing the multilayer dual SV sensor including a first spin valve stack, a second spin valve stack, and a longitudinal bias stack between the first and second SV stacks; annealing the sensor at a temperature in a magnetic field perpendicular to an air bearing surface; and annealing at a second temperature below the first temperature in a second magnetic field oriented parallel to the air bearing surface where the second field is lower than the first field.

23. Gill teaches forming a dual spin valve sensor (Figure 12). Gill does not disclose the method of making the spin valve sensor.

24. Huai discloses forming a dual spin valve sensor by sputtering (col. 9, l. 8-40).

25. Saito discloses that MTJ sensors can have a spin valve type structure and thus, are formed similarly using similar techniques (col. 8, l. 53-67).

26. Nakada discloses that when an MTJ sensor is formed, it is beneficial to use a two step anneal where the first anneal is at 270C and about 3000 Oe and the second anneal is at 150C at about 50 Oe (col. 6, l. 33-40).

Art Unit: 1753

27. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Gill to utilize a two step anneal as taught by Nakada because of the desire to magnetize the structure.

28. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize sputtering as the deposition method in Gill as taught by Huai because of the knowledge that sputtering is a conventional method for deposition in spin valve sensors.

29. For claim 25, Applicant requires the first temperature to be about 280C and the second is about 240C. As noted above, Nakada discloses the limitations.

30. For claim 26, Applicant requires the first magnetic field to be about 10000 Oe and the second magnetic field to be about 200 Oe. As noted above, Nakada discloses the limitations.

31. For claim 36, Applicant requires depositing a first decoupling layer; depositing a first ferromagnetic layer; depositing a layer of antiferromagnetic material; depositing a second ferromagnetic layer; and depositing a second decoupling layer. Gill discloses a first decoupling layer 302, ferromagnetic layer 210, antiferromagnetic layer 208, second ferromagnetic layer 212, and second decoupling layer 304. (See Fig. 12)

32. For claim 37, Applicant requires the decoupling layer to comprise Cu-O and Ru. Gill does not disclose the material of the decoupling layer. Huai discloses that conventional materials for the decoupling layer include Cu-O and Ru (col. 9, l. 20-30).

33. For claim 38, Applicant requires the ferromagnetic layers to be Co-Fe. Gill discloses the layers to be Co-Fe (See Fig. 12).

Art Unit: 1753

34. For claim 39, Applicant requires the antiferromagnetic layer to comprise Ir-Mn. Huai discloses that IrMn, and FeMn are interchangeable, conventional, and equivalent antiferromagnetic layers in spin valve sensors (col. 8, l. 59-63).

35. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,275,363 to Gill (Gill) in view of US 6,381,105 B1 to Huai et al. (Huai), US 6,341,053 B1 to Nakada et al. (Nakada) and US 6,590,803 B2 to Saito et al. (Saito) as applied to claims 24-26 and 36-39 above, and further in view of US 6,700,757 B2 to Pinarbasi.

36. For claims 40 and 41, Applicant requires the depositing to be DC magnetron sputtering.

37. Gill, Huai, Nakada, and Saito are described above, but none of the references discloses DC magnetron sputtering. Huai does, however, indicate that sputtering can be used.

38. Pinarbasi discloses that a conventional deposition method for dual spin valve sensors is magnetron DC sputtering.

39. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Gill in view of Huai, Nakada, and Saito to utilize DC magnetron sputtering because of the knowledge that it is a conventional deposition method for spin valve sensors.

Double Patenting

40. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

41. Claims 24-26 and 36-41 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 of copending Application No. 10/981,926 in view of US 6,590,803 to Saito et al. (Saito), US 6,381,105 to Huai (Huai) and Mouchot et al. (U.S. Pat. 5,635,835).

42. In regards to claim 24, Pending application 10/981,926 claims a method of fabricating a dual magnetic tunnel junction sensor comprising sputter depositing the multilayer dual MTJ sensor including a first MTJ stack, a second MTJ stack, and a longitudinal bias stack between the first and second MTJ stacks; annealing the sensor at a temperature in a magnetic field perpendicular to an air bearing surface; and annealing at a second temperature below the first temperature in a second magnetic field oriented parallel to the air bearing surface where the second field is lower than the first field (claim 1).

Art Unit: 1753

43. Regarding claims 25 and 26, the pending application claims the exact same limitations (claims 2-3).

44. Regarding claim 36, Claim 4 of the copending application teaches the longitudinal bias stack.

45. The pending application does not disclose forming a dual spin valve sensor, the material of the decoupling layers is not discussed, the first and second ferromagnetic layers is not discussed, the material of the antiferromagnetic layer is not discussed and the dc sputtering is not discussed.

46. Saito discloses that MTJ sensors have dual spin valve structures (col. 8, l. 53-57).

47. For claim 37, Huai discloses that conventional materials for the decoupling layer include Cu-O and Ru (col. 9, l. 20-30).

48. For claim 38, Applicant requires the ferromagnetic layers to be Co-Fe. Mouchot discloses the layers to be Co-Fe (col. 5, l. 1-4).

49. For claim 39, Applicant requires the antiferromagnetic layer to comprise Ir-Mn. Huai discloses that IrMn, and FeMn are interchangeable, conventional, and equivalent antiferromagnetic layers in spin valve sensors (col. 8, l. 59-63).

50. For claims 40 and 41, Huai does indicate that sputtering can be used.

51. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of the application to have a spin valve structure because of the knowledge that such a structure results in a drop of the magnetoresistance relative to the application voltage (col. 8, l. 53-57).

This is a provisional obviousness-type double patenting rejection.

Response to Arguments

Applicant's arguments filed 2-16-06 have been fully considered but they are not persuasive.

In response to the argument that Mouchot does not teach the utilization of a longitudinal bias layer, it is argued that Mouchot does teach a longitudinal bias layer since the bias layer could be considered parallel to the ABS if the ABS is to the right side of the substrate. Furthermore newly cited reference to Gill shows that the longitudinal bias layer is present which is parallel to the ABS surface while the pinned magnetic layers are perpendicular to the ABS surface. (See Mouchot and Gill discussed above)

In response to the argument that the obviousness-type double patenting is not applicable because the longitudinal bias stack is not taught, it is argued that claim 1 requires a longitudinal bias layer and that longitudinal bias layer can be constructed identical to Applicant's layer as discussed in Claim 4. Therefore the obviousness type double patenting rejection will be maintained.


This action will be made NON-Final based on the newly cited references.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

Art Unit: 1753

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
April 18, 2006